

Hazard Elimination Project Evaluation

Project Log # 200502100

Hazard Elimination Project W-4021

**Evaluation of the Pavement Widening to Provide Two Foot Paved Shoulders,
Pavement Resurfacing, and Guardrail Installations on NC 68 from
SR 2011 (Edgefield Road) to the Rockingham County Line
Guilford County**

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2/28/2006

Date

Hazard Elimination Project Evaluation Documentation

Subject Location

Evaluation of Hazard Elimination Project W-4021 –
On NC 68 from SR 2011 (Edgefield Road) to the Rockingham County Line, Guilford County

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis has been completed to measure the effectiveness of this hazard elimination project. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The safety countermeasures chosen for the subject location under Project W-4021 were to widen NC 68 to provide two foot paved shoulders and pavement resurfacing. Fourteen sections of guardrail were also installed along NC 68 as part of another hazard elimination project in conjunction with Project W-4021. The guardrail installations will also be discussed in this evaluation. Please see the *Location Map* for further detail of the guardrail locations. According to the project files, the guardrails were placed at the following locations:

1. 0.2 miles north of NC 65
2. 50 feet south of NC 65
3. 0.3 miles south of NC 65
4. 0.5 miles north of SR 2029
5. 500 feet north of SR 2029
6. 0.4 miles south of Haw River
7. 1.1 miles south of Haw River
8. 0.2 miles south of NC 150
9. At SR 2093
10. 0.3 miles south of SR 2093
11. 0.4 miles north of SR 2130
12. At SR 2016
13. 0.5 miles south of SR 2016
14. 0.8 miles south of SR 2016

Prior to the improvements, the subject location was a two-lane facility with 24 feet of pavement width and 6-10 feet of soil shoulders. The subject location is currently a two-lane facility from SR 2011 (Edgefield Road) to the southern intersection with NC 65. The segment of road on NC 68

from the southern intersection with NC 65 to the northern intersection with NC 65 is currently a three-lane facility with a center left-turn lane. The posted speed limit on NC 68 varies from 35 mph to 55 mph.

The initial crash analysis for this location was completed from April 1, 1996 through March 31, 1999 with a total of 315 reported crashes. According to the initial crash analysis, there were 37 Ran-Off Road, Right crashes and 278 “Random” Crashes. “Random” Crashes consisted mainly of Angle, Sideswipe, Rear-End, and Animal Crashes. It was felt that the construction of paved shoulders would reduce the potential for “Random” Crashes by providing motorists with additional pavement to maneuver to avoid crashes. It was also felt that the construction of paved shoulders would provide motorists with additional pavement to recover if they strayed to the right of the edge line. The pavement widening/ resurfacing and guardrail installations were completed on November 10, 2000. The estimated cost for the pavement widening/ resurfacing was \$1,339,000.

Naïve Before and After Analysis

After reviewing the hazard elimination project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from May 1, 2000 through April 30, 2001. The before period consisted of reported crashes from May 1, 1996 through April 30, 2000 (4 Years) and the after period consisted of reported crashes from May 1, 2001 through April 30, 2005 (4 Years). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The Total Crash treatment data consisted of all crashes on the 9.75-mile strip of NC 68 from SR 2011 (Edgefield Road) north to the Rockingham County Line. The Total Strip Crash treatment data consisted of all crashes at the treatment location that were located more than 150 feet from an intersection. The Total Crashes were isolated into Total Strip Crashes so that Lane Departure Crashes and Run-Off-Road Crashes could be more easily analyzed. A 0 feet Y-line was used in all analysis. Please see attached *Location Map* and *Location Photos* for further detail.

The following data Table 1 depicts the Naïve Before and After Analysis for Total Crashes, Total Strip Crashes, Lane Departure Crashes, Run-Off-Road Crashes (ROR Crashes), and crashes where guardrail was struck. Table 2 provides further examination of the Naïve Before and After Analysis for the ROR Crashes. Please note that Lane Departure Crashes included the following crash types: Ran Off Road - Right, Ran Off Road - Left, Ran Off Road - Straight, Overturn/Rollover, Fixed Object, Parked Motor Vehicle, Head On, Sideswipe - Same Direction, and Sideswipe - Opposite Direction. ROR Crashes were classified as Lane Departure Crashes where (according to the crash report) at least one vehicle left the roadway. Lane Departure Crashes, ROR Crashes, and crashes where guardrail was struck were located within the Total Strip treatment data.

<u>Table 1. Treatment Information</u>	Before Period	After Period	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	414	416	0.5
Total Severity Index	8.16	3.99	-51.1
Total Strip Crashes	199	225	13.1
Lane Departure Crashes	54	55	1.9
Lane Departure Severity Index	16.82	5.34	-68.3
ROR Crashes	34	38	11.8
ROR Severity Index	16.34	4.12	-74.8
Guardrail Struck	2	10	400.0
Volume	14000	16100	15.0

<u>Table 2. ROR Crash Information</u>	Before Period	After Period	Percent Reduction (-)/ Percent Increase (+)
Run Off Road Crashes			
Fatal Injury Crashes	3	0	-100.0
Non Fatal Injury Crashes	12	16	33.3
Total Injury Crashes	15	16	6.7
Night Crashes	13	18	38.5
Wet Crashes	13	6	-53.8
Alcohol/ Drug Crashes	3	6	100.0

The naive before and after analysis at the treatment location resulted in a 0.5 percent increase in Total Crashes, a 51.1 percent decrease in the Total Severity Index, and a 15.0 percent increase in Average Daily Traffic (ADT). There was also an 11.8 percent increase in ROR Crashes and a 74.8 percent decrease in the Severity Index for ROR Crashes. The number of crashes where guardrail was struck increased (by 400.0 percent) from two crashes in the before period to ten crashes in the after period. The before period ADT year was 1998 and the after period ADT year was 2003.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 0.5 percent increase in Total Crashes and an 11.8 percent increase in Ran-Off-Road (ROR) Crashes. Please note (as previously stated) that ROR Crashes were only analyzed in the sections of the treatment location that are more than 150 feet from an intersection. The summary results above demonstrate that the treatment location appears to have had a small increase in both Total and ROR Crashes from the before to the after period. The severity of crashes was reduced significantly from the before to the after period. The Total Severity Index and the ROR Severity Index decreased by 51.1 percent and 74.8 percent, respectively, at the treatment location.

The guardrail was installed to reduce the severity of the ROR crashes. Three fatal injury crashes and twelve non-fatal injury crashes occurred in the before period as a result of motorists running off the road. In the after period, there were no fatal ROR injury crashes and sixteen non-fatal ROR injury crashes (consisting of mostly class C injury crashes). The number of guardrail hits in this section increased by 400.0 percent from two crashes in the before period to ten crashes in the after period. It appears that although both the number of ROR crashes and the number of guardrail hits has increased, the severity of those crash types has decreased dramatically.

Although the project did decrease the crash severity of ROR crashes, it did not prevent motorists from leaving the roadway. The construction of paved shoulders did not correct the Run-Off-Road crash problem as intended. In the before period, there were thirty-four (34) ROR Crashes. In the after period, there were thirty-eight (38) ROR Crashes. The same crash pattern persists although improvements were made to the roadway from the before to the after period. Note that in the after period, 47.0 percent of ROR Crashes occurred at night, which may suggest the possibility of poor visibility. During the field investigation, the pavement width was measured in a cross section typical of the entire treatment location. The lane widths were measured at 13' and the paved shoulder at 1' in each direction. It appears that NC 68 is not currently striped with a 12' travel lane and 2' paved shoulder, as was intended in the project description.

Please note that three speed zone ordinances (that lowered speeds from 55 mph) have been enacted at the treatment location since the project improvements were completed. These ordinances are noted because they cover a large portion (approximately 1/3) of the treatment location and because they may have an effect on the number and severity of crashes in the after period.

1. On NC 68, from 0.11 miles south of SR 2129 north to 0.20 miles north of NC 150
45 mph Speed Limit; 0.85 mile segment; Enacted 3/28/2002
2. On NC 68, from 0.15 miles south of SR 4406 north to 0.11 miles south of SR 2129
50 mph Speed Limit; 1.12 mile segment; Enacted 3/28/2002
3. On NC 68, from 0.27 miles north of US 158 north to the Rockingham County Line
50 mph Speed Limit; 1.33 mile segment; Enacted 4/15/2004

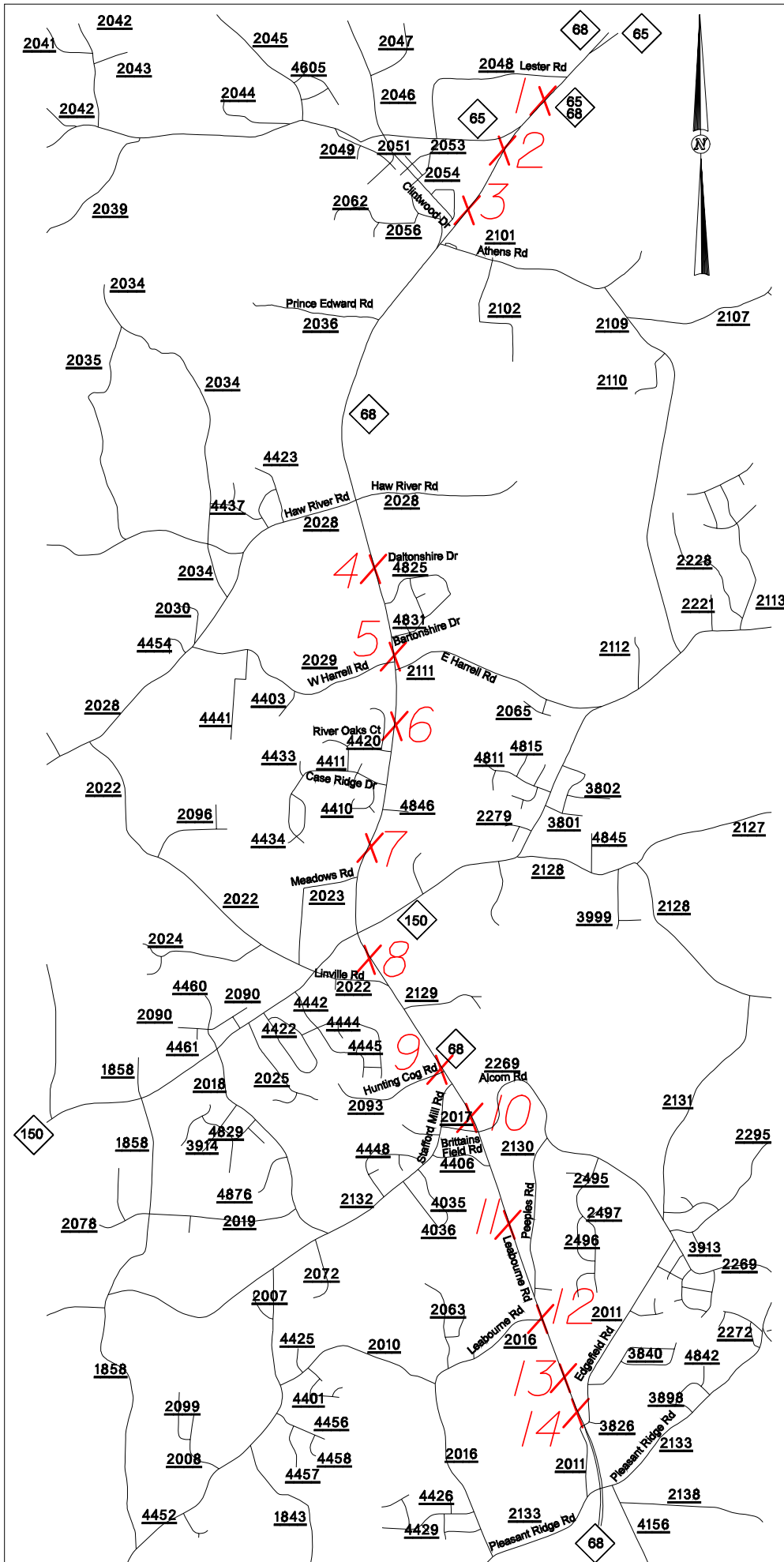
The traffic volume at the Treatment Location increased by 15 percent from the before to the after period. This section of NC 68 has experienced large growth in recent years, with new housing developments and strip malls being built as the population of Greensboro grows and expands northward. Therefore the increase in crashes at the Treatment Location may be influenced by the increase in traffic volume.

Please see the attached Treatment Site Photos for additional visual information. Photos are provided for most of the guardrail locations. The photos were taken while driving southbound on NC 68 from the Rockingham County Line to the southern project limits at SR 2011 (Edgefield Road).

As the Safety Evaluation Group completes additional reviews for this type of countermeasure, we will be able to provide more objective and definite information regarding actual crash reduction factors.

Location Map Hazard Elimination Project W4021

Guilford County



Treatment
Location:
On NC 68,
from SR 2011
North to
County Line

X Denotes
Guardrail Location
1-14

Treatment Site Photos (Taken on November 3, 2005)



Driving Southbound on NC 68 at Guardrail Location 1



Driving Southbound on NC 68 at Guardrail Location 2

Treatment Site Photos (Taken on November 3, 2005)



Driving Southbound on NC 68 at Guardrail Location 3



Driving Southbound on NC 68 at Guardrail Location 5

Treatment Site Photos (Taken on November 3, 2005)



Driving Southbound on NC 68 at Guardrail Location 7



Driving Southbound on NC 68 at Guardrail Location 8

Treatment Site Photos (Taken on November 3, 2005)



Driving Southbound on NC 68 at Guardrail Location 9



Driving Southbound on NC 68 at Guardrail Location 10

Treatment Site Photos (Taken on November 3, 2005)



Driving Southbound on NC 68 at Guardrail Location 11



Driving Southbound on NC 68 at Guardrail Location 13

Treatment Site Photos (Taken on November 3, 2005)



Driving Southbound on NC 68 at Guardrail Location 14



Driving Southbound on NC 68. At this location, the lane width was measured at 13' and the paved shoulder width was measured at 1' in both directions.